

## MODULAR WALL UNIT SYSTEM

### CROSS-REFERENCES TO RELATED APPLICATIONS

[0001] This application claims the benefit of U.S. Provisional Application No. 62/647,550, filed Mar. 23, 2018, entitled “MODULAR WALL UNIT SYSTEM.” The disclosure of this application is incorporated by reference herein in its entirety.

### TECHNICAL FIELD

[0002] The present disclosure relates generally to electrical systems and in particular to a modular and configurable utility system for a building.

### BACKGROUND

[0003] Smart home technology has greatly improved in power and functionality in recent years and can provide an enhanced user experience that can be tailored to meet an individual user's particular needs. For instance, smart lights, smart security systems, smart entertainment systems, environmental control systems (HVAC), and the like, are becoming more and more customizable and integrated as the internet-of-things (IoT) sets a foothold in modern home designs.

[0004] Configuring the smart home can present many challenges. For instance, the differentiation of brands and their incompatibilities between each other, differing connection and communication protocols, wiring and connector types, hardware/software configurations, and general system set up can be daunting to the average consumer. Even technology savvy enthusiasts may be challenged by the non-intuitive and often frustratingly laborious process of configuring a fully integrated smart home. Furthermore, smart home networks often need to be reconfigured, sometimes extensively, as old equipment is replaced with new equipment. Despite the many advantages that smart home technology brings to society, there is a need for smart home systems that can allow lay-consumers to more easily customize, scale, and reconfigure their homes in a more effortless and user friendly manner.

### SUMMARY

[0005] According to certain embodiments, a modular host system comprises: one or more processors; a host unit configured to be coupled to a support structure of a building and configured to: receive and house an accessory; and electrically couple to an electrical source, the host unit including: a power gating module, controlled by the one or more processors, and configured to couple electrical power from the electrical source to the accessory; and a communication module, controlled by the one or more processors, and configured to communicate with one or more additional host units installed in the building. In some aspects, the communication module may communicate by sending or receiving communication data with the one or more additional host units. The one or more processors may be configured to: determine a distance between the host unit and each of the one or more additional host units based on the communication with the one or more additional host units; and determine a floor plan of the building based at least on the distance from the host unit to each of the one or more additional host units. The modular host system may further

comprise: a self-orientation module, controlled by the one or more processors, and configured to determine an orientation of the host unit, wherein the one or more processors further determine the floor plan of the building based on the orientation of the host unit. It should be noted that although many of the embodiments described herein relate to host systems in a single building, some embodiments may be employed over multiple buildings or structures.

[0006] In some embodiments, the self-orientation module can include: a multi-antenna array configured to send and receive communication data from multi-antenna arrays of the one or more additional host units, wherein the orientation of the host unit is based on a phase angle of arrival of the communication data from the one or more additional host units. Alternatively or additionally, the self-orientation module may include: a magnetometer operating as a compass; and an accelerometer configured to detect an orientation of the host unit relative to a direction provided by the magnetometer. The modular host system can further comprise an authentication module, wherein in response to the host module receiving the accessory, the authentication module is configured to receive an authentication request from the received module and provide access to one or more of the electrical power from the power gating module and communication resources from the communication module. The power gating module can include an electrically operated relay configured to: couple the electrical power received from the electrical source to the accessory while the accessory is communicatively coupled to the host unit; and block the electrical power received from the electrical source while the accessory is communicatively decoupled from the host unit.

[0007] In certain embodiments, the communication module can communicate with the one or more additional host units using at least one of an ultra-wide band (UWB), radar, ultrasonic, or IEEE 802 communication protocols. The modular host system can further comprise a networking interface module configured to provide wireless communication resources to the accessory in response to the accessory being physically coupled to the host unit and the accessory being authenticated. In some aspects, the modular host system can further comprise a communication gating module configured to provide wired network access to the accessory in response to the accessory being physically coupled to the host unit and the accessory being authenticated. The accessory may be one of a list of accessories including, but not limited to: an electrical power outlet; a thermostat; an image detection device; an audio detection device; an audio source device; a light source; a video source; a touchscreen user input device; and a control switch. Although the embodiments described herein include accessories being physically coupled to the host unit, in some embodiments, the accessory may not be physically coupled to the host unit, but the host and accessory may be electronically coupled, magnetically coupled, communicatively coupled, or the like.

[0008] In further embodiments, a method of operating a modular system comprises: establishing an electronic communication between a host unit and one or more additional host units in the building, wherein the host unit is embedded within a support structure of a building; determining a distance from the host unit to the one or more additional host units based on the electronic communication between the host unit and the one or more additional host units; and